

- 1 1) A method of filtering data prior to reading a digital watermark that was inserted
2 using a scale to black technique, said method comprising the steps of first
3 projecting the color values of each pixel onto a preferred projection axis that is
4 determined by examining the color of the surrounding pixels, and by reading the
5 watermark from the resulting data.
6
- 7 2) A system for reading a digital watermark from a digital image which consists of a
8 number of pixels, each pixel being defined by a set of numbers representing the
9 color components of the particular pixel, a filter for calculating the value of each
10 pixel along a preferred projection axis, and a watermark reader which operates
11 on the values calculated by the filter.
12
- 13 3) A method of calculating values that will be used to read a watermark from a
14 digital image comprising the steps of: projecting the color values of each
15 particular pixel to a preferred projection axis, said preferred projection axis being
16 determined by averaging the colors of the pixels in an area surrounding said
17 particular pixel.
18
- 19 4) The method recited in claim 1 wherein the pixels in an area of three by three
20 pixels is examined to determine the preferred projection axis.
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- 22 5) The method recited in claim 1 wherein said watermark has a particular tile size
23 and wherein said the pixels in an area the size of said tile are examined to
24 determine the preferred projection axis.
25
- 26 6) The system recited in claim 2 wherein said filter examines the pixels in an area
27 of three by three pixels to determine the preferred projection axis.
28

1 13) A method of reading a digital watermark from a colored image that consists of
 2 a plurality of pixels and which was watermarked using a scale to black
 3 watermarking technique, said method comprising the steps of
 4 first filtering said colored image to generate filtered data by projecting the color
 5 values of each pixel onto a selected axis that is determined by examining the color
 6 of the surrounding pixels, and
 7 reading the watermark from the resulting filtered data.

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 9 14) A method of reading a digital watermark from a digital colored mage that
 10 consists of a number of pixels, each pixel being defined by a set of numbers
 11 representing the color components of the particular pixel,
 12 filtering the value of the set of numbers that represents each pixel by projecting said
 13 values to a selected axis, the direction of said selected axis being determined by
 14 examining the values of the pixels in an area surrounding said pixel, and reading
 15 said watermark from the values calculated by the filter.

16
 17 15) The method recited in claim 14 wherein said filter determines the direction of
 18 said selected axis for each pixel by examining the values of the pixels in a three by
 19 three area surrounding said pixel.

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 21 16) A watermark reading method for reading a watermark that has been inserted
 22 into the luminance value of the pixels of an image by projecting color changes
 23 needed to embed said watermark onto the luminance axis of each pixel by
 24 projecting from an axis from black to the color of the pixel, said method comprising
 25 filtering said image prior to reading said watermark by first projecting the color
 26 values of each pixel onto a preferred projection axis that is determined by
 27 examining the color of the surrounding pixels, and by reading the watermark from
 28 the resulting data.

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- 1 17) A method of inserting first and second watermarks in an image comprising,
2 inserting said first watermarks in said image in a first color direction and inserting
3 said second watermark in a color direction orthogonal to the color direction of said
4 first watermark.
5
- 6 18) A method of reading two orthogonally inserted watermarks from an image by
7 first filtering said image to project each pixel onto a preferred projection axis
8 determined by the average color of the surrounding pixels and reading said first
9 watermark from the resulting data, and then projecting each pixel onto an axis
10 orthogonal to said preferred projection axis and reading the second watermark from
11 the resulting data.
12
- 13 19) The method recited in claim 17 wherein the intensity of said second watermark
14 is lower than the intensity of said first watermark.
15
- 16 20) A method of filtering an image containing a digital watermark to generate a set
17 of values from which said digital watermark can be read, said digital watermark
18 having been inserted along a particular color axis, said method comprising
19 projecting the color values of each pixel onto a color axis which approximates the
20 color axis used to embed said watermark in said pixel.
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